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ABSTRACT

The paper reports an attempt to evaluate instructional practices in compensatory education by looking at both costs and effects associated with the practices. The study covered some 300 Chapter 1 projects over a three-year period, focusing on project settings and instructional approaches used in the projects. Results of the study indicated that the pull-out setting produced the highest achievement gains and the most favorable cost-effectiveness ratio. A prescribed instructional system, supplemented by a miscellany of other materials, produced the highest achievement gains and the most favorable cost-effectiveness ratio. The cost information generated clearly provides a better basis for determining the relative worth of the various instructional settings and approaches used in compensatory education. (Author)

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A Cost-Analytic Approach to Determining Chapter 1 Program Impact: Some Preliminary Findings

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A COST-ANALYTIC APPROACH TO DETERMINING CHAPTER 1 PROGRAM IMPACT: SOME PRELIMINARY FINDINGS

Abstract

The paper reports an attempt to evaluate instructional practices in compensatory education by looking at both costs and effects associated with the practices. The study covered some 300 Chapter 1 projects over a three-year period, focusing on project settings and instructional approaches used in the projects. Results of the study indicated that the pull-out setting produced the highest achievement gains and the most favorable cost-effectiveness ratio. A prescribed instructional system, supplemented by a miscellany of other materials, produced the highest achievement gains and the most favorable cost-effectiveness ratio. The cost information generated clearly provides a better basis for determining the relative worth of the various instructional settings and approaches used in compensatory education.

A Cost-Analytic Approach to Determining

Chapter 1 Program Impact: Some Preliminary Findings

INTRODUCTION

Chapter 1 represents one of the largest federal investments in education for disadvantaged youth in the nation. Typically, Chapter 1 projects provide remedial instructional services in basic skills areas such as reading and mathematics. In a majority of the projects, the services were provided in a pull-out setting (Stonehill and Anderson, 1982). Instructional approaches used in these projects are often described as "eclectic" involving the use of teacher-made as well as commercially packaged materials. The adoption or adaptation of instructional settings and approaches is often a matter of logistical convenience or fiscal necessity rather than an outcome of careful deliberations of benefits and impact.

While there has been little direct evidence to indicate the efficacy, or the lack of it, of the pull-out setting, negative perceptions have been expressed by some researchers. Harnischfeger (1980), for example, pointed out two major shortcomings of the pull-out setting. First, pull-out teachers have little contact with the regular classroom teachers. As a result, there is little coordination or integration with regular classroom instruction and the regular classroom teachers lose close contact with the progress of students who are pulled-out. Secondly, when students receive reading instruction in a pull-out program, usually they are pulled-out of the regular reading instruction. Consequently, pull-out students do not receive extra learning opportunity and often receive less reading time than the rest of the class due to

increased transition time. On the other hand, since the pull-out setting often means smaller class size and generally provides greater instructional support to students, it could be expected to produce greater achievement (Tobias, 1982). Smith and Glass (1980) found that reducing class size had beneficial effects on both cognitive and affective outcomes.

Compensatory education programs that appear different may not have differential impact upon participants. In a review of the effects of different curricula in early childhood education, Weikart (1981) found that the expected major differences between curricula simply were not obtained. The author suggested that the basic issues in successful programming had to do with the quality of program implementation rather than the philosophy of curriculum selected.

In much the same vein, Tobias (1982) argued that external differences between instructional treatments, whether they are educational media, methods of organizing the classroom, or technological devices, are important only in terms of the degree to which they influence the student's cognitive activities while engaged by the instructional content. External differences in instructional arrangements that lead to similar cognitive processing will result in comparable achievement, irrespective of superficial differences between methods. The author suggested that, generally, any instructional method or procedure which induces students to spend more time on task than a comparison mode will result in higher achievement. In the Instructional Dimensions Study (IDS), Cooley and Leinhardt (1980) found that pull-out instruction was related inversely with reading achievement. However, in a reanalysis of

the same data involving only pull-out students, a positive relationship was evident between pull-out and posttest achievement in reading (Leinhardt and Pallay, 1982). Teachers involved in the IDS project expressed mixed opinions about the pull-out setting. On the negative side, pull-out was said to be a managerial headache, demoralizing and disruptive to the children. On the positive side, it was seen as a way of providing intensive remediation to children who needed it. In an evaluation of the Emergency School Aid Act, Coulson et al. (1977) found that the pull-out setting was inversely associated with achievement. The authors reported that a change from receiving no pull-out instruction in reading to receiving one half reading instruction in a pull-out setting was associated with a reduction in reading achievement.

Leinhardt and Pallay (1982) reported empirical work that demonstrated success, failure and no difference in a variety of instructional settings. The authors concluded that while setting was not an overwhelming variable in and of itself, it was worth investigating as a variable which influences features of instruction which affect student learning.

Findings of no significant differences between instructional settings are consistent with Dahllof's (1971) assertion that achievement cannot be regarded as a direct outcome of the grouping arrangement. As Leinhardt and Pallay (1982) pointed out, a setting does not eliminate or guarantee the presence of effective instructional practices. Most of the important variables can occur in most settings.

Program impact is, of course, only one side of the coin, the other side being program costs. If program impact has, de facto, become a constant (there being no significant differences), it would make sense for program managers to look at cost as an important variable in deciding the relative merit of a program or a particular program component. The present study is an attempt to look at relative cost-effectiveness as an essential element of program evaluation.

PROCEDURE

The study grew out of an increased awareness of information needs in making curriculum decisions at Chapter 1 project schools in Hawaii. It was conducted jointly by an external researcher and internal project staff. The study consisted of a secondary analysis (Burstein, 1978) of evaluation data gathered over a period of three years to address the following research questions:

1. What is the relative cost-effectiveness of different instructional settings in Chapter 1 projects?
2. What is the relative cost-effectiveness of different instructional approaches in Chapter 1 projects?

No experimental manipulation was used in the study. Data were coded from evaluation reports for some 300 Chapter 1 projects over a three-year period. Project settings and instructional approaches examined in the study were as follows:

Pull-out. This involved the pulling out of participating students from the regular classroom to receive remedial instructional services from the Chapter 1 teacher or teacher aide in a small group setting.

Regular classroom. The setting required the Chapter 1 teacher or aide to intervene directly in the regular classroom. The teacher or aide worked with project students while instruction was being provided to non-project students by the regular classroom teacher at the same time.

Combination. This involved the provision of instructional services in a combination of pull-out and regular classroom settings.

Instructional system. This consisted of the use of a prescribed system with a set of commercially packaged materials along with protocols for their use.

Materials only. This approach allowed the Chapter 1 teacher or aide to use materials, both commercially packaged and teacher-made, in ways she/he saw fit without having to follow prescribed protocols.

Combination. This consisted of the adaptation of a prescribed instructional system along with associated materials and the use of a miscellany of other materials, commercial or teacher-made, to supplement the prescribed system.

Data sources were limited to evaluation reports prepared by external evaluators and related documents (e.g., state directories and welfare reports) for the 1978-81 school years.

Data Coding

Data coding was conducted by graduate students hired by the Hawaii state department of education. The coding covered some 300 plus evaluation reports and included such information as student grouping, diagnostic testing, inservice training, in addition to achievement gains, project settings, instructional approaches and project costs. With respect to the coding of instructional approaches a list of basal materials used in Chapter 1 projects was prepared by the compensatory education staff. The list was reviewed by language arts specialists at the state department of education. Based on this review, the three primary categories of instructional approaches mentioned earlier were established.

As would be expected, a number of problems were encountered in coding information from the evaluation reports, including:

Missing data. Information was not provided in the district or school-level reports. For example, no information on project settings and instructional approaches was obtained for secondary projects for the 1978-79 and 1979-80 school years.

Ambiguous narratives. Some project narratives in the school-level reports were difficult to interpret. For example, in some cases the project setting was not clearly described.

Lack of discreteness. Many projects used composite project settings and student groupings. For instance, some narratives mentioned use of individual, small group and large group instruction with various grouping configurations.

Most problems were resolved on the basis of the data coders' best judgment. In other cases, the data sheets were left blank.

Data Analysis

Completed data sheets were key-punched and quality control measures were taken to ensure accuracy of coding and validity of the coded data. A few cases were discarded because of excessive missing data and some inaccuracies in coding were corrected. Data analyses were then performed on the "clean" data. Project schools were used as the unit of analysis. Initially, analyses were conducted by subject area (i.e., reading and mathematics). Due to the relatively small number of projects in mathematics, subsequent analyses were confined to reading projects.

Student achievement was measured by means of the norm-referenced model of the Title I Evaluation and Reporting System (Tallmadge, et al., 1981). The model provides a measure of achievement growth attributable to Chapter 1 projects on an equal-interval scale consisting of normal curve equivalents (NCEs). Weighted means were calculated in aggregating data across grades (2-12) and across projects.

The study took advantage of various streamlining methods in conducting a marginal cost anaysis (Levin, 1983), Chapter 1 being a supplementary instructional program. Specifically, total "ingredients" cost was computed by determining the level of funding allocated by the state education agency to each project. Contributed inputs (e.g., parent involvement), carry-over funds and monies saved were assumed to be either negligible or comparable across projects. Per pupil cost was obtained by dividing the total "ingredients" cost for each project by the number of students participating in the project. A cost-effectiveness ratio was computed by dividing per pupil cost by average NCE gains made by students receiving instruction under the various project settings and instructional approaches.

RESULTS

Project Profile

Based on descriptive statistics provided in the analyses, project profiles were developed for Chapter 1 projects included in the study. The data indicate that for the three school years included in the study the average Chapter 1 reading project enrolled 98-127 students in five different grades and provided 96-99 hours of instruction annually. The project employed 3.4-4.9 FTE staff and produced an achievement gain of 7-8 NCEs at a per pupil cost of $672-$712.

A comparison suggests that while project features (e.g., project enrollment, duration, hours of instruction and costs) fluctuated somewhat over the years, project impact in terms of NCE gains was quite stable, ranging from a low of 7.4 for the 1979-80 school year to a high of 8.2 for the 1980-81 school year. Pretest status increased from 18.7 NCEs (7 percentile) for the 1978-79 school year to 22.6 NCEs (10 percentile) for the 1980-81 school year. On the other hand, increasingly less money was spent on the average student. The per pupil cost declined from $712 in 1978-79 to $672 in 1980-81.

Project Setting

A majority (72 percent) of the projects provided instructional services in a pull-out setting. A small number (18 percent) provided instruction in the regular classroom. Some (10 percent) projects used a combination of settings (see Table 1). Results of the analysis suggest that the pull-out setting was a viable approach to providing Chapter 1 services. Students who received instruction in this setting performed as well as, if not better than, their counterparts in other settings. Specifically, these students as a group made an NCE gain of 8.8 as

compared with gains of 6.3 and 7.5 in the regular classroom and the "combination" settings, respectively.

The cost analysis revealed that the pull-out setting produced a unit of NCE gain for every $81 expended on project students. Corresponding figures for the regular classroom and the "combination" settings were $84 and $86, respectively. Thus, the pull-out setting produced the highest NCE gains and had the most favorable cost-effectiveness ratio. Achievement gains made in the regular classroom setting were, on the average, lower than those made in the "combination" setting. However, it also cost a little less to produce a unit of NCE gain in the regular classroom setting than it did in the combination setting.

Table 1 about here

Instructional Approach

Most (80 percent) of the projects used a combination of instructional approaches, i.e., materials with a prescribed instructional system as well as materials without such a system. Some (14 percent) of the projects used only materials with a prescribed instructional system and a few (6 percent) used only materials without a prescribed system. The results in Table 2 suggest that a combination of approaches may well be superior to either approach. Students who received instruction in a combined approach made an average NCE gain of 9.4, comparing favorably with gains of 8.1 and 7.1 under a prescribed instructional system and under "materials only," respectively.

Table 2 about here

Results of the cost-analysis also favor the "combination" approach. The data show that this approach produced a unit of NCE gain for every $71 expended on project students. Corresponding figures for instructional systems and "instructional materials only" were $77 and $91, respectively.

Thus, students who received Chapter 1 instruction under a combination of instructional approaches (e.g., a prescribed system supplemented by miscellaneous materials) were likely to make greater achievement gains than their counterparts under single approaches. The combination approach also produced the most favorable cost-effectiveness ratio. The "instructional materials only" approach yielded the lowest average achievement gain and the least favorable cost-effectiveness ratio.

DISCUSSION

Contrary to negative perceptions expressed by some researchers (Harnischfeger, 1980), the pull-out setting was shown to have superior cost-effectiveness among project settings examined in the study. With regard to instructional approaches, the combination approach was shown to have worked as well as, if not better than, other approaches. In terms of achievement gain, students who received Chapter 1 instruction in the pull-out setting performed as well as, if not better than, their counterparts in other settings. This suggests that despite its apparent drawbacks (e.g., loss of regular classroom instruction, increased transition time) the pull-out setting remains a viable option for providing services to Chapter 1 youngsters. Students who received Chapter 1 instruction under a combination of instructional approaches

(e.g., a prescribed system supplemented by miscellaneous materials) made as much, if not greater, achievement gains as their counterparts under single approaches. This perhaps points to the validity of allowing the teaching staff flexibility in using materials in ways most suitable for individual students in a project.

Previous findings on the relationship between student achievement and expenditures receive support from the present study. Polley (1976), for example, found a positive relationship between median teacher salaries and student achievement. Moreover, per pupil cost on principals' salaries was also positively related to achievement. Since the major share (over 80 percent) of Chapter 1 expenditures consists of personnel costs, the per pupil cost index used in the present study was highly similar to expenditure indices used in Polley's study. Cost indices used in the present study correlated positively ($r = .37$, $p < .05$) with achievement gains. Undoubtedly, this occurs because per pupil cost is a surrogate for program elements (e.g., more experienced teaching staff, better facilities and materials) which tend to produce high achievement.

This finding is particularly pertinent in view of the current budget reductions in education programs. The cost cutting trends are presumably based on the belief that there is no relationship between expenditure and student achievement. This belief runs counter to the findings of the present study which indicate that higher per pupil costs not only result in greater achievement but do so with more favorable cost-effectiveness ratios.

During the course of the study, both the state and district compensatory education staff have indicated the importance of teacher

variables as contributing factors to project impact. It was pointed out that the regular classroom setting had worked well in some schools where Chapter 1 teachers were well trained and where communication between the regular classroom teacher and Chapter 1 staff was effective. Furthermore, staff turnover was perceived to be a major factor affecting project impact. These teacher variables are undoubtedly important elements of a project and should receive attention in future studies of project impact.

CONCLUDING REMARKS

For too long educational researchers and evaluators have overlooked the importance of cost as a variable to be included in decisionmaking and policy formulation. Recent trends, however, suggest that both state and local education agency personnel as well as university researchers will be called upon to provide cost analysis information as a critical element of program evaluation. Cost analysis appears even more essential where research on teaching has shown non-significant differences between instructional treatments with respect to student outcomes. The present study provides an example of evaluation which looks at instructional processes in terms of cost as well as program impact. The cost information generated clearly provides a better basis for determining the relative worth of the various instructional settings and approaches.

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Table 1

Relative Cost-Effectiveness of Project Settings of Chapter 1 Reading Projects (N=287)

Variable	Regular Classroom	Pull-out	Combination
No. of Projects	51	207	29
Per Pupil Cost	532	713	646
NCE Gains	6.3	8.8	7.5
Cost Effectiveness Ratio	84	81	86

Table 2

Relative Cost Effectiveness of Instructional Approaches of Chapter 1 Reading Projects (N=169)

Variable	Instructional Systems	Instructional Materials Only	Combination
No. of Projects	23	10	136
Per Pupil Cost	622	644	699
NCE Gain	8.1	7.1	9.4
Cost-Effectiveness Ratio	77	91	71